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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/845,845	04/30/2001	Xia Sheng	10007799-1	3212

7590 12/31/2003

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EXAMINER	
SANTIAGO, MARICELI	

ART UNIT	PAPER NUMBER
2879	

DATE MAILED: 12/31/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/845,845	SHENG ET AL.	
	Examiner	Art Unit	
	Mariceli Santiago	2879	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 October 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-39* is/are pending in the application.

4a) Of the above claim(s) *15-39* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,5-9,12 and 13* is/are rejected.

7)☒ Claim(s) *4,10,11 and 14* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *30 April 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Response to Amendment

The Amendment, filed on October 6, 2003, has been entered and acknowledged by the Examiner.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2, 5, 7-9, 12 and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Watabe et al. (EP 1047095 A2).

Regarding claim 1, Watabe discloses a high emission electron emitter for injection into a vacuum towards a collection electrode (12) comprising an electron injection layer (1) including a front-side surface (top surface) and a back-side surface (bottom surface), the electron injection layer (1) is biased to a first voltage (Fig. 1), an active layer of high porosity porous silicon material (6d) in contact with the front-side surface, a contact layer (6c) of low porosity porous silicon material (Column 41, paragraph [0151]) in contact with the active layer (6d) and including an interface (top surface), and an n-type (phosphorus impurity) heavily doped region (6c, Column 43, paragraph [0160]) extending inward of the interface surface, the n-type heavily doped region characterized by a low resistivity (Column 43, paragraph [0160]), the n-type heavily doped region is biased to a second voltage that is at a higher positive potential relative to the first voltage, and wherein the collector electrode is biased to a third voltage that is at a

higher positive potential relative to the second voltage so that electrons are injected into the vacuum towards the collector electrode (see Fig. 1, Column 16, paragraph [0049]).

Regarding claim 2, Watabe discloses an electron emitter wherein the electron injection layer comprises an electrically conductive material selected from the group consisting of a n+ semiconductor, a metal and a layer of metal on a glass substrate (Column 42, paragraph [0052]).

Regarding claim 5, Watabe discloses an electron emitter wherein the back-side surface of the electron injection layer (1) includes an ohmic contact (2) and the ohmic contact is biased to a first voltage (see Fig. 1, Column 16, paragraph [0049]).

Regarding claim 7, Watabe discloses an electron emitter further comprising a top electrode (7) in contact with the interface surface and the top electrode being biased to the second voltage (see Fig. 1, Column 16, paragraph [0049]).

Regarding claim 8, Watabe discloses an electron emitter wherein the top electrode is made from an electrically conductive gold material (Column 40, paragraph [0143]).

Regarding claim 9, Watabe discloses an electron emitter wherein the contact layer of low porosity porous silicon material and the active layer of high porosity porous material are a material of porous polysilicon (Column 41, paragraph [0151]).

Regarding claim 12, Watabe discloses an electron emitter wherein the porous polysilicon is a material selected from the group of n-porous polysilicon, p-porous polysilicon and intrinsic porous polysilicon (Column 44, paragraph [0164]).

Regarding claim 13, Watabe discloses an electron emitter wherein the n-porous polysilicon, the n-type heavily region of the contact layer includes a dopant material selected from the group consisting of arsenic, phosphorus and antimony (Column 44, paragraph [0164]).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 2, 3 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watabe et al. (EP 1047095 A2) in view of Yoshikawa et al. (US 5,990,605).

Regarding claims 2 and 3, Watabe discloses the claimed invention except for the limitation of the electron injection layer comprises an electrically conductive material selected from the groups consisting of a n+ single crystal silicon material and an electrically conductive silicide, the material including a crystalline orientation selected from the group consisting of a 100 crystalline orientation and a 111 crystalline orientation. However, in the same field of endeavor, Yoshikawa discloses an electron emitter comprising an electron injection layer comprising an electrically conductive material selected from the groups consisting of a n+ single crystal silicon material and an electrically conductive silicide (Column 5, lines 59-65), the n+ single crystal silicon material having a (100) crystalline orientation (Column 6, lines 4-23) and further discloses the general suitability and use of the n+ single crystal silicon material, for the conductive electron injection layer, in the field of electron emitters (Column 5, lines 59-65). Furthermore, it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416. Accordingly, it would have been obvious to one having ordinary skills in the art at the time the invention was made to incorporate the materials and crystalline orientation disclosed by Yoshikawa in the electron emitter of Watabe, since the selection of known materials for a known purpose and the general suitability of the n+ single

crystal material or the electrically conductive silicide as the electron injection layer material, as evidenced by Yoshikawa, is within the skill of the art.

Regarding claim 6, Watabe discloses the claimed invention except for the limitation of the ohmic contact being made from a material selected from the group consisting of gold, a gold alloy, platinum, platinum alloy, aluminum, aluminum alloy, a multiplayer of metal, tantalum on top of gold, and chromium on top of gold. However, in the same field of endeavor, Yoshikawa discloses an electron emitter further comprising an ohmic contact layer made of a material selected from the group comprising of Au, Pt and Al (Column 7, lines 56-59) and further discloses the general suitability and use of Au, Pt and Al materials, for the ohmic contact, in the field of electron emitters (Column 7, lines 56-59). Furthermore, it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416. Accordingly, it would have been obvious to one having ordinary skills in the art at the time the invention was made to incorporate the Al, Pt or Au for the ohmic layer as disclosed by Yoshikawa in the electron emitter of Watabe, since the selection of known materials for a known purpose and the general suitability of Al, Pt or Au as the ohmic layer material, as evidenced by Yoshikawa, is within the skill of the art.

Allowable Subject Matter

Claims 4, 10, 11 and 14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Regarding claim 4, the references of the Prior Art of record fails to teach or suggest the combination of the limitations as set forth in claim 4, and specifically comprising the limitation of

the electrically conductive silicide being selected from the group consisting of a titanium silicide and a platinum silicide, and the electrically conductive nitride comprising a titanium nitride.

Regarding claim 10, the references of the Prior Art of record fails to teach or suggest the combination of the limitations as set forth in claim 10, and specifically comprising the limitation of the porous epitaxial silicon being a material selected from the group consisting of n- porous epitaxial silicon, p- porous epitaxial silicon and intrinsic porous epitaxial silicon.

Regarding claim 11, claim 11 is allowable for the reasons given in claim 10 because of its dependency status from claim 10.

Regarding claim 14, the references of the Prior Art of record fails to teach or suggest the combination of the limitations as set forth in claim 14, and specifically comprising the limitation of for the porous silicon carbide, the n-type heavily doped region of the contact layer includes a dopant material selected from the group consisting of nitrogen, phosphorus and vanadium.

Response to Arguments

Applicant's arguments with respect to claims 1-14 have been considered but are moot in view of the new ground(s) of rejection.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mariceli Santiago whose telephone number is (703) 305-1083. The examiner can normally be reached on Monday-Friday from 9:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimesh Patel, can be reached on (703) 305-4794. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Mariceli Santiago 12/28/03
Mariceli Santiago
Patent Examiner
Art Unit 2879